Claims 1 to 15 are now pending. Claims 1, 2, 3, 4, 7 and 13 are amended. The amendments to the claims are made without prejudice, admission, surrender or any intention to create any estoppel as to equivalents. Although Applicants disagree with the assertions made in the Office Action concerning claims 1 to 14, however, in the interest of expediting the prosecution of this application, the claims are amended and Applicants reserve the right to pursue canceled subject matter in a continuation application. Support for amended claims 1, 2, 3, 4, 7 and 13 can be found in the originally filed specification. Support for newly presented claim 15 can be found in the originally filed specification on page 7, line 12. No new matter is added.

Claims 1 to 15 are pending.

This opportunity is taken to thank the Examiner for acknowledging the claims for priority under 35 U.S.C. §119 and receipt of the certified copy of International Application No. PCT/JP97/04848, in substantiation of that claim.

The disclosure is objected to due to various informalities (Office Action, at 2 to 6).

Specifically, the specification is said to lack explanation concerning the standard DIN 53461-B or the experimental conditions under which the HDT is determined. Additionally, the specification is said to lack the date of the particular version of the standard that was used.

Applicants respectfully disagree and submit the following in response, without prejudice or any admission. The term "DIN 53461-B" denotes a standard testing method. Specifically, "DIN" is defined in *The Illustrated Dictionary of Electronics*, Fifth Edition, 1991 by McGraw-Hill, page 166 as an abbreviation for *Deutsche Industrie Normenausschuss*, a German Association that sets standards for the manufacture and performance of electrical and

electronic equipment, as well as other devices. For Examiner's convenience, a copy of the front cover of *The Illustrated Dictionary of Electronics*, Fifth Edition, 1991 by McGraw-Hill and page 166 are enclosed as Exhibit 1. In addition, for Examiner's convenience, attached as Exhibit 2 is a DIN standard demonstrating that for a measurement of polyolefin viscosity, a heat distortion temperature (HDT) by the DIN 53461-B method of 70°C or higher can be measured by the GPC method. This was obtained from the Internet and the search term was "DIN 53461-B". Thus, there is no need for the Applicants to explain the DIN standard since it is readily available on the Internet and to one skilled in the art.

It is a well-known principle that a patent application is directed to the skilled artisan and need not teach that which is known in the art. **Furthermore, the definiteness requirement of Section 112 cannot be used to require more precision than the relevant technology permits or is capable of generating.** Orthokinetics, Inc. v. Safety Travel Chairs, Inc., 1 U.S.P.Q. 2d 1081 (Fed. Cir. 1986); Hybritech, Inc. v. Monoclonal Antibodies, Inc., 231 U.S.P.Q. 81 (Fed. Cir. 1986), cert. denied, 480 U.S. 947 (1987).

The function of the written description requirement is to ensure that the inventor had possession, as of the filing date of the application relied on, of the specific subject matter claimed by him, and to ensure that sufficient information is disclosed so as to enable the public to practice the claimed subject matter; how the specification accomplishes this is not material. In re Smith, 178 U.S.P.Q. 620 (C.C.P.A. 1973). The test for written description under 35 U.S.C. § 112, first paragraph, is whether the specification disclosure reasonably conveys to a person having ordinary skill possession of the subject matter claimed. In re Kaslow, 217 U.S.P.Q. 1089 (Fed. Cir. 1983).

It is not necessary that the specification exactly describe the limitations, but only so clearly that those skilled in the art would recognize from the disclosure the claimed process, including those limitations. In re Wertheim, 191 U.S.P.Q. 90 (C.C.P.A. 1976).

The specification as filed reasonably conveys the presently claimed invention to a person having ordinary skill in the art

In addition, Applicants respectfully remind the Examiner, that the test is not whether the application describes the claimed invention exactly, but only so clearly that persons of ordinary skill in the art will be enabled from the disclosure to make and use the claimed subject matter. In re Wertheim, 191 U.S.P.Q. 90 (C.C.P.A. 1976); In re Eichmeyer, 202 U.S.P.Q. 655 (C.C.P.A. 1979). And, as already stated, **the definiteness requirement of § 112 cannot be used to require more precision than the relevant technology permits or is capable of generating.** Orthokinetics, Inc. v. Safety Travel Charis, Inc., 1 U.S.P.Q.2d 1081 (Fed Cir. 1986); Hybritech, Inc. v. Monoclonal Antibodies, Inc., 231 U.S.P.Q. 81 (Fed. Cir. 1986), cert. denied, 480 U.S. 947 (1987).

Applicants respectfully assert that one skilled in the art would be fully enabled to practice the claimed invention from the description in the application, i.e., pages 1 to 27 providing 27 pages of general teachings including numerous patents and literature citations, thirty examples, six comparative examples and from the knowledge in the art.

Reconsideration and withdrawal of the objection to the specification is respectfully requested.

The Office Action also raised objections to the term "aerosol silica". Applicants respectfully confirm that "aerosol silica" and "colloquial silica" are synonyms.

The Office Action further asserts that although the specification defines

ISOPAR H® as an electrolytic solution, however, according to the Office Action, ISOPAR H® is known to be a non-polar hydrocarbon liquid.

Applicants respectfully disagree and enclose as Exhibit 3, the chemical property of ISOPAR H® fluid (found on the ExonMobil Chemical website) which provides that ISOPAR H® fluid has a specific conductivity $(OHM\text{-}CM)^{-1}$ of 50×10^{-15} max when tested with AM-1 915 method. Accordingly, ISOPAR H® fluid is an electrolytic thus, withdrawal and reconsideration of this objection is respectfully requested.

The Office continued its objection to the disclosure by asserting that it is not clear as to how examples provided in the present specification are made by both methods 1 and 3, or by methods 4 and 5 since method 1 is not the same as method 3, nor is method 4 the same as method 5.

Applicants respectfully disagree with this assertion and respectfully invite the Examiner's attention to review page 25, lines 1 to 5 of the originally filed specification, which states:

> In Examples 1 to 8 and 20 to 30 and Comparative Examples 1, 2, 5 and 6, two methods for toner preparation are employed. However, the toner formulation and the resin structure are common, so that the results on the evaluation items are the same.

In view of the foregoing, withdrawal and reconsideration of the objection to the examples in the specification are respectfully requested.

The Office Action objected to the improper use of the trademarks in the specification. The Examiner is thanked for her helpful suggestion. Accordingly, appropriate corrections are made to the trademarks.

Additionally, claims 3 and 7 are objected to for lack of antecedent basis. The specification has been amended to provide proper antecedent basis and the objection is now moot.

Regarding objections to claims 13 and 14, Applicants agree with the Examiner's assertion concerning "liquid dried system". Accordingly, claims 13 and 14 are properly supported.

Claims 1 to 14 are rejected under 35 U.S.C. §112, second paragraph as said to be indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regards as the invention (Office Action, at 6 to 8).

Although Applicants respectfully disagree with the Examiner's assertion, in the interest of expediting the prosecution of this application, claims and the specification are amended.

In view of the amendments to the claims and the specification, withdrawal and reconsideration of the rejections to claims 1 to 14 based on 35 U.S.C. §112, second paragraph are respectfully requested.

Claims 1 to 9 and 12 are rejected under 35 U.S.C. §102(a) as said to be anticipated by WO97/05529 ("WO '529") (Office Action, at 8 to 11). Claim 14 is rejected under 35 U.S.C. §103(a) as said to be unpatentable over WO '529 (Office Action, at 11 to 12). Claims 10 and 11 are rejected under U.S.C. §103(a) as said to be unpatentable over WO '529combined with U.S. Patent No. 5,707,772 to Akimoto et al. ("Akimoto) (Office Action, at 12 to 13). Claim 14 is rejected under 35 U.S.C. §103(a) as said to be unpatentable over U.S. Patent No. 4,923,778 to Blair et al. ("Blair"), as further evidenced by U.S. Patent No. 5.019,477 to Felder ("Felder") (Office Action, at 13 to 14). Claim 13 is rejected under 35 U.S.C. §103(a) as said to be

unpatentable over U.S. Patent No. 5,843,613 to Fujisawa et al. ("Fujisawa"), as further evidenced by ACS file Registry No. RN 64365-06-6 ("ACS"), combined with Felder and U.S. Patent No. 4,659,640 to Santilli ("Santilli") (Office Action, at 15 to 19). These rejections will be addressed collectively.

The present invention claims and discloses a toner for development of an electrostatically charged image. More specifically, the invention teaches a dry one-component magnetic toner, a dry one-compartment nonmagnetic toner, a dry two-compartment toner, a dry polymerized toner, a liquid dried toner, or a liquid toner which, when fixed, is excellent in anti-spent toner effect, and can form a well fixed, highly transparent, sharp image. The toner in accordance with the present invention can be used in copiers, printers, facsimile machine, color copiers, color laser printers, and electrophotographic high speed printers. Specifically, the toner in accordance with the present invention is for developing an electrostatically charged image wherein the binder resin is a polyolefin resin having a cyclic structure and comprises at least two portions of the resin of lower (<7,500) or high (>7,500) molecular weight. The binder may either be a mixture of different molecular weight cyclic polyolefin resins or a cyclic polyolefin resin with molecular weight distribution possessing at least two peaks. More particularly, the polyolefin resin in the toner for development of an electrostatically charged image has a cyclic structure, a resin or resin fraction having an intrinsic viscosity (i.v.) of 0.25 dl/g or more, and a number average molecular weight (Mn) of 7,500 or more and a weight average molecular weight (Mw) of 15,000 or more, as measured by the GPC method, is contained in a proportion of less than 50% by weight based on the entire binder resin.

WO '529 relates to a hot-roller fixing toner for developing electrostatically charged images which mainly comprises a binder resin, a colorant and a charge control agent,

characterized in that the binder resin at lease comprises a polyolefin resin having a cyclic structure and contains less than 50 wt. % of a polyolefin resin having a cyclic structure, satisfying the relationships: I.V. (intrinsic viscosity) $\geq$ 0.25 dl/g and HDT (heat deformation temperature according to DIN 53461-B) $\leq$ 70°C and exhibiting a number average molecular weight of 7,500 or above and a weight-average molecular weight of 15,000 or above as determined by GPC. This toner is useful in fixation, light transmittance and inhibition of spent toner generation and can give clear and high-quality images. Further, the toner can be applicable to dry single component type magnetic toners, dry single-component type nonmagnetic toners, dry two-component type toners and liquid toners. This toner can also be used as color toners. However, WO '529 provides a narrow offset-free temperature range suitable for practical use and unable to achieve full fixing at a higher copying speed.

Contrary to WO '529, the present invention provides a toner in a dry two-component, dry nonmagnetic one-component, dry magnetic one-component, dry polymerized, liquid dried, or liquid toner developer which exhibits the effects achieved by Japanese Patent Application No. 354063195, which shows a sufficiently broad offset free temperature range suitable for practical use, can attain sufficient fixing even by high speed copying, and gives a higher grade image, namely, a well fixed, highly optically transparent, sharp image in an electrostatically charged image developing copier or printer.

Thus, the WO '529 is limiting in its application of polyolefin resins having a cyclic structure and a high molecular weight, which are characterized by a HDT of 70°C or higher. In the examples of WO '529, only one high molecular weight species of such resin is disclosed possessing a glass transition temperature (Tg of 80°C). Besides such high molecular

weight components, polyolefin resins having a cyclic structure and a lower molecular weight can be used in the binder formulations of the earlier patent application.

Contrary to WO '529, in the present invention, high molecular weight components of polyolefin resins having a cyclic structure and possessing a glass transition temperature Tg of lower than 70°C can be used. A basis for this assertion can be found on page 7, line 12 of the present specification. Furthermore, the Examiner's attention is respectfully requested to review the examples in the present specification, wherein such resins are disclosed (*See* Samples Nos. 2 and 9 in Table 2).

Akimoto relates to a toner having at least one resin, a colorant and a releasing agent, wherein a low molecular weight polyolefin polymer synthesized by using a metallocene catalyst is employed as aforesaid releasing agent. Specifically, the polyolefin polymer of Akimoto has a preference melting point between 70°C or more and less than 150°C. More particularly, 75°C to 140°C. Akimoto further noted that when it is less than 70°C, the antiaggregation property is degraded. This is contrary to the T_g value of the present invention.

Blair relates to a process for preparation of toner particles for electrostatic liquid developers utilizing a single vessel wherein a thermoplastic resin and hydrocarbon liquid having a kauributanol value of less than 120 at a total of solids of at least 22% by weight are dispersed in the vessel by moving particulate media (crating shear) at elevated temperatures to plasticize and liquify the resin, while the particulate media are maintained in continuous motion the dispersion is cooled whereby the resin precipitates in the form of toner particles having an average by area particle size of 10μm or less and the particulate media are removed. Liquid electrostatic developers are prepared by the addition of a charge director compound. The liquid developers are useful for preparation of copies and proofs of various colors.

Blair uses a nonpolar liquid and its toner particles are adapted for electrophoretic movement. In addition, Blair uses a thermoplastic resin whereas the toner in accordance with the present invention utilizes polyolefin resin having a cyclic structure and uses an electrolytic, thus polar liquid.

Accordingly, Blair does not teach or suggest the present invention and there is no teaching or motivation for one to modify Blair in order to achieve the present invention.

The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggests the desirability of the modification. In re Fritch, 23 U.S.P.Q. 2d 1780, 1783-1784 (Fed. Cir. 1992). There must be some prior art teaching which would have provided the necessary incentive or motivation for modifying the primary reference in the manner suggested by the Examiner. In re Laskowski, 12 U.S.P.Q. 2d 1397, 1399 (Fed> Cir. 1989).

Felder relates to a liquid electrostatic developer having a nonpolar liquid having a kauributonol value of less than 30, thermoplastic resin particles comprised of a mixture of polyethylene homopolymer or a copolymer of polyethylene and acrylic acid, methacrylic acid or the alkyl esters thereof, wherein the acrylic acid comprises 0.1 - 20 weight percent of the polymer and a random copolymer of a monomer selected from the group consisting of vinyltoluene and styrene and a monomer selected from the group consisting of butadiene and acrylate, wherein the thermoplastic resin particles are dispersed in the non-polar liquid form and an ionic or zwitterionic charge director compound which is soluble in the non-polar liquid.

Contrary to the present invention, Felder relates to the use of thermoplastic resin particles with non-polar liquid whereas the present invention teaches a toner using a binder resin comprising at least a polyolefin resin having a cyclic structure with a polar liquid.

Fujiwara relates to a liquid developer for electrophotography having carrier liquid, another particles, dispensed in the carrier liquid, formed of binder resin and colorant, wherein the carrier liquid contains acidic dispersion resin and basic dispersion resin which are soluble in the carrier liquid. Further, Felder relates to a liquid developer for electrophotography having carrier liquid, toner particles, dispensed in the carried liquid, formed of binder resin and colorant, wherein the liquid developer contains a basic dispersion resin that is soluble in the carrier liquid and has a moisture content of 500 ~ 20,000 PPM, and has an acid group on the surface of the toner particle.

Fujiwara does not teach or suggest the use of a polyolefin resin. More particularly, Fujiwara lacks the teaching or the motivation to use a high molecular weight polyolefin resin having a glass transition temperature Tg of lower than 70°C. In fact, there was no specification as to any preferred temperature range.

Although the Office Action admits that Fujiwara does not disclose that the toner particles further having a wax and a charge control agent as claimed in claim 13, however, the Office Action asserts that Fujiwara discloses that the toner particles can comprise various types of additive agents necessary in resin microparticles. However, Fujiwara in fact never teach or suggest the use of a polyolefin resin having a cyclic structure as a binder resin and certainly Fujiwara did not and need not define an optimal glass transition temperature of less than 70°C.

ACS does not teach or suggest the characteristics of the present invention as disclosed and claimed.

Santilli relates to a liquid electrographic developer having a volatile, electrically insulating carrier liquid, polyester toner particles and wax dispensed in the carrier. The wax-to-polyester weight ratio in the developer is sufficiently high, preferably above 0.25, thereby

rendering the developer self-fixing at room temperature. Santilli also relates to a process for developing an electrostatic latent image on a smooth support using a self-fixing liquid developer. Upon application of Santilli's developer to a latent image and evaporation of the liquid carrier from the image, the toner, aided by the wax to the surface without the need for externally applied heat.

Contrary top the present invention, Santilli lacks the teaching of using a polyolefin resin having a cyclic structure and a preferred glass transition temperature T_g of less than 70°C.

The Office Action relies on the combination of the seven documents for rejecting the pending claims.

Initially, the Examiner's attention is respectfully invited to consider that WO '529 is only available under Section 103 via Sections 102(e) and 102(a).

The rejection based on WO '529 is thus overcome by removing WO '529 as a reference by showing that the inventors for WO '529, namely Toru, Nakamura, Toshimi, Nishioka, Takuya, Hoga and Junichi Fukuzawa are not "another" as to the present inventive entity. This is done by showing that Nakamura, Nishioka, Hoga and Fukuzawa are common inventors in both WO '529 and the present pending application.

In this regard, attention is respectfully invited to In re Kaplan, 789F. 2d 1574, 229 U.S.P.Q. 678 (Fed. Cir. 1986) and Applied Materials v. Gemini Research Corp. 5 U.S.P.Q. 2d 1127, 1129-1130 (Fed. Cir. 1988) wherein the Federal Circuit held that, "though an application and a patent have ... different inventive entities, if they **share one or more** persons as joint inventors, the 35 U.S.C. § 102(e) exclusion for a patent granted to "another" is not necessarily satisfied."

If called upon, Applicants will provide a Declaration under 37 C.F.R. § 1.132 pursuant to M.P.E.P. §706.02 to further demonstrate that the inventive entity of WO '529 is not "another" as to the inventive entity of the present application under 35 U.S.C. § 102(a) and §102(e); but, in view of the case law discussed herein, such is not believed to be necessary.

Accordingly, the inventive entity of WO '529 employed in the rejection is not "another" as to the present inventive entity, therefore, the WO '529 is not available under §102(a) and §102(e), and thus, the rejection cannot stand and has been overcome.

Furthermore, "for a prior art reference to anticipate in terms of 35 U.S.C. § 102, every element of the claimed invention must be identically shown in a single reference." Scripps clinic & Research Foundation v. Genentech, Inc. 18 U.S.P.Q. 2d 1001 (Fed. Cir. 1991). Since WO '529 does not disclose or suggest every element for example, the glass transition temperature T_g of less than 70°C) of the presently claimed invention, ergo, WO '529 does not teach or suggest the combination of the composition claimed and disclosed in the toner in accordance with the present invention and the 35 U.S.C. § 102 rejection based on WO '529 cannot stand since WO '529 fails to suggest the claimed invention.

Reconsideration and withdrawal of the Section 102(b) rejections in the Office Action based on WO '529 is respectfully requested.

In addition, Applicants further assert the following:

For the Section 103 rejection to be proper, both the suggestion and the expectation of success must be founded in the prior art, and not Applicants' disclosure. In re Dow, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988).

Even if the cited documents at most, suggested that it could be "obvious to try" incorporating a hydrophilic polymer, specifically PVP, into the polymer alloy in order to

improve the hydrophilicity of membranes comprised of polyether ketones and polysulfones (and such is **not** admitted herein), it is respectfully urged that the Examiner cannot properly establish that these documents show that there would be a reasonable expectation of success for properly a novel polymer alloy composition characterized by improved mechanical and chemical properties compared with pure polymers as defined in the application and claims (see discussion *infra*). However, whether a particular product or method might be "obvious to try" is not a legitimate test of patentability. In re Fine, 5 U.S.P.Q.2d 1596, 1599 (Fed.Cir. 1988); Hybritech Inc. v. Monoclonal Antibodies, Inc., 231 U.S.P.Q. 81, 91 (Fed.Cir. 1986); Ex parte Old, 229 U.S.P.Q. 196, 200 (PTO Bd. App. & Int. 1985). "Obvious to try" is not the standard.

The combination of references cited and the rationale behind the combination, it is respectfully submitted, clearly demonstrates selective hindsight. Indeed, a combination of seven (7) documents clearly, it is respectfully submitted, evinces hindsight (because if it takes a combination of seven documents to allege obviousness, then clearly there must be selective picking and choosing involved in the rejections, or invention in the claimed subject matter). Hindsight, based on Applicants' own success as disclosed in the present application, is not a justifiable basis on which to contend that the ultimate achievement of the present invention would have been obvious at the time the invention was made. In re Fine, 5 U.S.P.Q.2d 1596, 1599, 1600 (Fed.Cir. 1988) ("One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention"). The only clear link among the cited documents is the present application; and hindsight reconstruction is not a proper basis for combining references and rejecting claims.

Moreover, in an obviousness rejection, the standard established in In re Fritch, 23 U.S.P.Q.2d 1780, 1783-84 (Fed. Cir. 1992), must be followed. Fritch in pertinent part states (with emphasis added):

> Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under Section 103, teachings of references can be combined only if there is some suggestion or incentive to do so ... **The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification.**

Even though a reference can be modified in a way that the Examiner suggests, this does not mean that the reference renders the instant invention obvious unless the motivation to do the modification is in the references teaching. It is respectfully submitted that no such teaching exists in the references cited by Examiner either alone or in any combination. There is nothing in the reference teachings suggesting the modification or the desirability of the modification. There is no evidence in the Office Action showing why the skilled artisan would have combined the cited references and then would have arrived at the present invention.

There must be some teaching, suggestion, or incentive in the references (and not Applicants' disclosure) that supports the combination of the references. In re Fine, 5 U.S.P.Q. 2d 1596, 1599, 1600 (Fed. Cir. 1988). No such teaching, suggestion or incentive is in the cited documents.

According to the Board of Patent Appeals and Interferences in the case of Ex parte Obukowicz, 27 U.S.P.Q.2d 1063, 1065 (B.P.A.I. 1992) (with emphasis):

> In proceedings before the Patent and Trademark Office, the Examiner bear the burden of establishing a prima facie case of obviousness based upon the prior art. In re Piasecki, 745 F.2d

> 1468, 1471-72, 223 U.S.P.Q. 785, 787-88 (Fed. Cir. 1984). **The Examiner can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art *would lead* that individual to combine the relevant teachings of the references.** In re Fine, 837 F.2d 1071, 1074, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). **Indeed, the teachings of references can be combined only if there is some suggestion or incentive to do so.** ACS Hospital Systems, Inc. v. Montefiore Hospital, 723 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984).

The picking and choosing from all the cited references to allege that the instant invention is anticipated or obvious simply fails in light of the case law under Section 103. The Examiner is invited to cite references for the desirability of modification and the teaching, suggestion or incentive for combination and for modification of the reference teachings or provide an affidavit, as called for by 37 C.F.R. § 1.106(b) and M.P.E.P. § 706.02(a). Otherwise, it is respectfully submitted that the Section 103 rejection must be withdrawn.

Accordingly, none of the cited references, alone, or in any combination, render Applicants' invention *prima facie* obvious. Moreover, none of the references teaches or suggests the surprising properties of the presently claimed invention, as shown in the application, which properties, Applicants submit are additionally demonstrative of the patentability of the instant invention.

Reconsideration and withdrawal of the Sections 102(a) and 103(a) are respectfully requested.

In view of the foregoing amendments, remarks and attachments, reconsideration and withdrawal of the objections to and rejections of claims 1 to 14 are respectfully requested.

Pursuant to 37 C.F.R. §§1.136(a) and 1,17(a)(2), Applicants hereby request that the term for reply to the July 12, 2000 Office Action be extended two months, i.e., up to and including December 12, 2000. A check for $390.00 is enclosed herewith.

Any additional fee occasioned by this paper, including with respect to the claim amendment herewith and the petition for extension of time, or any overpayment in those fees, may be charged or credited to Deposit Account No. 50-0320.

In view of the amendments, remarks and attachments (Exhibits 1 to 3) herewith, the present application is in condition for allowance. Early and favorable reconsideration and prompt issuance of a Notice of Allowance are earnestly solicited.

Respectfully submitted,

FROMMER LAWRENCE & HAUG LLP

By: _____

Grace L. Pan
Reg. No. 39,440
Samuel H. Megerditchian
Reg. No. 45,678
TEL: (212) 588-0800
FAX: (212) 588-0500

The Illustrated Dictionary of Electronics

Fifth Edition

Rufus P. Turner
Stan Gibilisco

McGraw-Hill, Inc.
New York St. Louis San Francisco Auckland Bogotá Caracas
Lisbon London Madrid Mexico City Milan Montreal New Delhi
Paris San Juan São Paulo Singapore Sydney Tokyo Toronto

FIFTH EDITION
THIRD PRINTING

Library of Congress Cataloging-in-Publication Data

Turner, Rufus P.
The illustrated dictionary of electronics / by Rufus P. Turner and Stan Gibilisco.
p. cm.
ISBN 0-8306-7345-8 ISBN 0-8306-3345-6 (pbk.)
1. Electronics—Dictionaries. I. Gibilisco, Stan. II. Title.
TK7804.T87 1990
621.381'03—dc20
90-22674
CIP

For information about other McGraw-Hill materials, call 1-800-2-MCGRAW in the U.S. In other countries call your nearest McGraw-Hill office.

Acquisitions Editor: Roland S. Phelps
Technical Editor: Lisa A. Doyle
Director of Production: Katherine G. Brown
Book Design: Lisa A. Doyle and Jaclyn J. Boone

est diameter of an elongated ellipsoid of revolution to the shortest.

dimensional stability Nonvariance or little variance in the shape and size of a medium (such as film) during the processing of that material.

dimensionless quantity A quantity which, rather than being physical, is merely a number. Example: logarithm, exponent, numerical ratio, etc. In contrast are the physical quantities: 3 volts, 5000 hertz, 10 amperes, etc.

diminished radix complement *See* COMPLEMENT.

dimmer An electronic device usually for dimming incandescent lamps. Employing amplified control, the device enables high-wattage lamp loads to be smoothly controlled with a small, light-duty (often, volume-control-type) rheostat, or potentiometer. A photoelectric-type dimmer automatically controls lamps in accordance with the amount of daylight.

dimmer curve The function of a light-dimmer voltage output as a function of setting on a linear scale.

DIN Abbreviation for *Deutsche Industrie Normenausschuss*. A German association that sets standards for the manufacture and performance of electrical and electronic equipment, as well as other devices.

D indicator In radar practice, an indicator combining type B and C indicators (*see* B DISPLAY and C DISPLAY).

D indicator In radar practice, an indicator combining type B and C indicators (*see* B DISPLAY and C DISPLAY).

Dingley induction-type landing system An aircraft landing system providing lateral and vertical guidance; instead of radio it employs the magnetic field surrounding two horizontal cables laid on or under either side of the runway.

diode A device containing an anode and a cathode (as a tube) or a pn junction (as a semiconductor device) as principal elements and providing unidirectional conduction.

diode action 1. The characteristic behavior of a diode, i.e., rectification and unidirectional conduction. 2. Two-electrode rectification or unidirectional conductivity in any device other than a diode (e.g., rectification between the grid and cathode of a triode, or asymmetrical conductivity between the collector and base of a transistor).

diode amplifier 1. A parametric amplifier employing a varactor. 2. An amplifier utilizing hole-storage effects in a semiconductor diode (*see* CRYSTAL AMPLIFIER, 2). 3. A negative-resistance amplifier employing a tunnel diode.

diode array A combination of several diodes in a single housing.

diode assembly *See* DIODE ARRAY.

diode bend Triode plate-current saturation occurring at the point where positive grid voltage equals plate voltage. Diode bend occurs before normal plate-current saturation when the plate voltage is lower than that required for full cathode emission.

diode bias 1. In a vacuum tube, dc bias resulting from diode rectification in the control-grid/cathode circuit. 2. A steady dc voltage applied to a diode to establish its operating point.

diode capacitance The total capacitance shunting a diode. In a semiconductor diode, the capacitance between terminals and electrodes and the internal, voltage-variable capacitance of the junction. In a tube diode, the capacitance between terminals and the internal plate-cathode capacitance.

diode capacitor 1. A capacitor normally operated with a diode. 2. A voltage-variable capacitor utilizing the junction capacitance of a semiconductor diode.

diode-capacitor memory cell A high-value capacitor in series with a high-back-resistance semiconductor diode. An information pulse forward-biases the diode and charges the capacitor, which remains charged (holding an information bit) because of the long time constant of the high capacitance and the high back resistance of the diode.

diode characteristic 1. The current-voltage curve of a diode (tube or semiconductor). 2. In tube testing, the current-voltage characteristic when all electrodes except the cathode are connected to act as the plate of an equivalent diode; the technique provides a rough measure of tube condition.

diode checker An instrument for testing semiconductor diodes. There are two forms: A static checker, which measures dc forward and reverse current; and a dynamic checker (*see* DYNAMIC DIODE TESTER), which displays the entire diode response curve on an oscilloscope screen.

diode chopper A chopper employing an alternately biased diode as the switching element.

diode clamping Clamping achieved with diodes. *Also see* CLAMPING DIODE.

diode clipper A clipper employing one or more diodes. A single, dc-biased diode will limit the positive or negative peak of an applied ac voltage, depending on diode polarity and bias; two biased diodes with opposing polarity will clip both peaks. *Also see* LIMITER.

DIODE CLIPPER

diode converter *See* DIODE MIXER.

diode current 1. The forward or reverse current of a diode. 2. In a tube, current flowing in the grid-cathode circuit as a result of diode action between the elements when the grid signal voltage is positive.

diode current meter A dc milliammeter or microammeter with a semiconductor-diode rectifier for measuring ac.

diode curve changer A diode or network of diodes employed to make a linear current-voltage curve take some other shape.

diode demodulator *See* DEMODULATOR PROBE and DIODE DETECTOR.

diode detector A detector circuit in which a diode (semiconductor or tube) demodulates the signal. The diode, a simple device, provides linear response at high signal amplitudes, but affords no amplification.

TECHNICAL PROPERTIES OF ZELLAMID®

3/99

Property		Unit	Test method DIN ISO VDE* IEC*	Condition of specimen	ZELLAMID® 202 (PA6)	ZELLAMID® 250 (PA6.6)	ZELLAMID® 900 (POM-C)	ZELLAMID® 1400 (PETP)	ZELLAMID® 1400T (PETP+solid lubricant)
MECHANICAL PROPERTIES									
Tensile strength at break		N/mm²	53455 527	dry	80	80	70	80	75
		N/mm²	53455 527	moist	50	60	-	-	-
Elongation at break		%	53455 527	dry	50- 100	50	40	20	5
		%	53455 527	moist	200	150	-	-	-
Modulus of elasticity in tension		N/mm²	53452 178	dry	3000	3200	3000	3200	2230
		N/mm²	53452 178	moist	1500	1600	-	-	-
Impact strength	+ 23°C	kJ/m²	53453 179	dry	no break	no break	no break	82	23
	- 40°C	kJ/m²	53453 179	dry	no break	no break	80-no break	-	-
Impact strength (double-V notch, rK=1,5 mm)		kJ/m²	53753 -	dry	70	80	-	14	10
		kJ/m²	53753 -	moist	no break	no break	-	-	-
Izod notched impact strength, method A	+ 23°C	J/m	- 180	dry	85	40	-	-	-
	- 40°C	J/m	- 180	dry	35	30	-	-	-
Impact strength in drop test on housing [2] W_{50}	+ 23°C	N*m	53443 -	dry	> 140	> 140	-	80	-
	- 20°C	N*m	55443 -	dry	45	50	-	-	-
Ball indentation hardness [3] H 358/30		N/mm²	53456 2039	dry	150	160	160	-	-
		N/mm²	53456 2039	moist	70	100	-	-	-
Time yield limit σ 1/1000	23°C/50% RH	N/mm²	53444 899	moist	5.5	6.0	14	12	-
	100°C	N/mm²	53444 899	dry	2.5	3.5	-	-	-
Apparent modulus E C/1000 2O	23°C/50% RH	N/mm²	53444 899	moist	230	400	-	-	-
THERMAL PROPERTIES									
Heat distortion temperature, ISO 75	Method A	°C	53461 75	dry	55 – 75	100	110	67	-
	Method B	°C	53461 75	dry	> 160	> 200	160	165	-
Melting point	Method A	°C	53736 1218	-	220	255	164-168	255	-
Maximum service temperature for few hours operation		°C	--	-	≤ 180	≤ 200	-	160	160
TEP 5 000 hours (50% of tensile strength)		°C	53446 216*	-	90	95	-	115	115

TEP 20 000 hours (50% of tensile strength)		°C	53446 216*	-	75	80	100	100	100
Thermal coefficient of linear expansion		$1/K.10^{-5}$	53752 -	dry	7– 10	7– 10	11	6	6
Thermal conductivity	Method A	W/(K.m)	53612 -	dry	0.23	0.23	-	-	-
Specific heat		J/(g.K)	52612 -	dry	1.7	1.7	1.5	-	-
DIELECTRIC PROPERTIES									
Dielectric constant	1 MHz	-	53483 250*	dry	3.5	3.2	3.8	3.3	-
		-	53483 250*	moist	7.0	5.0	-	-	-
Dissipation factor tan δ	1 MHz	-	53483 250*	dry	0.023	0.026	0.024	0.02	-
		-	53483 250*	moist	0.3	0.2	-	-	-
Dielectric strength		KV/mm	53481 243*	dry	100	120	> 55	50	-
		KV/mm	0303T2* 243*	moist	60	80	-	-	-
Volume resistivity		Ω .cm	53482 167*	dry	10^{15}	10^{15}	10^{15}	10^{16}	-
		Ω .cm	53482 167*	moist	10^{12}	10^{12}	-	-	-
Surface resistivity ROA		Ω	53482 167*	dry	10^{13}	10^{13}	-	-	-
		Ω	53482 167*	moist	10^{10}	10^{10}	-	-	-
Resistance to tracking	KA/ KB method	-	53480 112*	dry/moist	KB > 600	KB >600	KB >600	KA >450	-
	KC method	-	0303T1* 112*	dry/moist	KC > 600	KC > 600	-	KC > 600	-
MISCELLANEOUS PROPERTIES									
Mass density	Method D, E	g/cm³	55479 1183	dry	1.13– 1.15	1.13– 1.15	1.41-1.43	1.36	1.38
Moisture absorption at 23° C, 50% RH	Saturation	%	53714 1110	-	3.0± 0.4	2.8± 0.3	0.20	~ 0.23	~ 0.23
Water absorption at 23 °C	Saturation	%	53495 62	-	9.5± 0.5	8.5± 0.5	0.25	~ 0.5	~ 0.5
Fire performance	VDE		0304T3* -	dry	II b	II b	BH3- 25mm/min	II b	-
	FMVSS- 302, (rate of flame propagation)	mm/min	75200 -	moist	< 100	< 100	-	< 100	-
	UL 94 test (thickness of specimen 1,6 mm)	-	- -	-	94 V-2/HB	94 V-2	94 HB	94 HB	94 HB
Resistance to wear [4]		μ m/km	7148-2	dry	-	-	-	22	1.1

1. Dry= dried at 80°C and 1 mbar until weight is constant (moisture content less than 0.2%)
2. Moist=after storage in a standard atmosphere of 23° C and 50% relative humidity (DIN 50014) until saturation.
3. Specimen boxes, thickness t=1.5 mm
4. Made by a pin / rotating disc test according DIN-ISO 7148-2 under following conditions: R_a = 0,35 – 0,45 μ m (steel disc), v = 0,3 m/s, p = 3 N/mm², test time T>16h

Fyzikální vlastnosti plastů

S & CH TRADE CZ společnost s r.o.

Orientační vlastnosti materiálů :

(měřeno při 23°C, 50% rel. vzdušné vlhkosti)

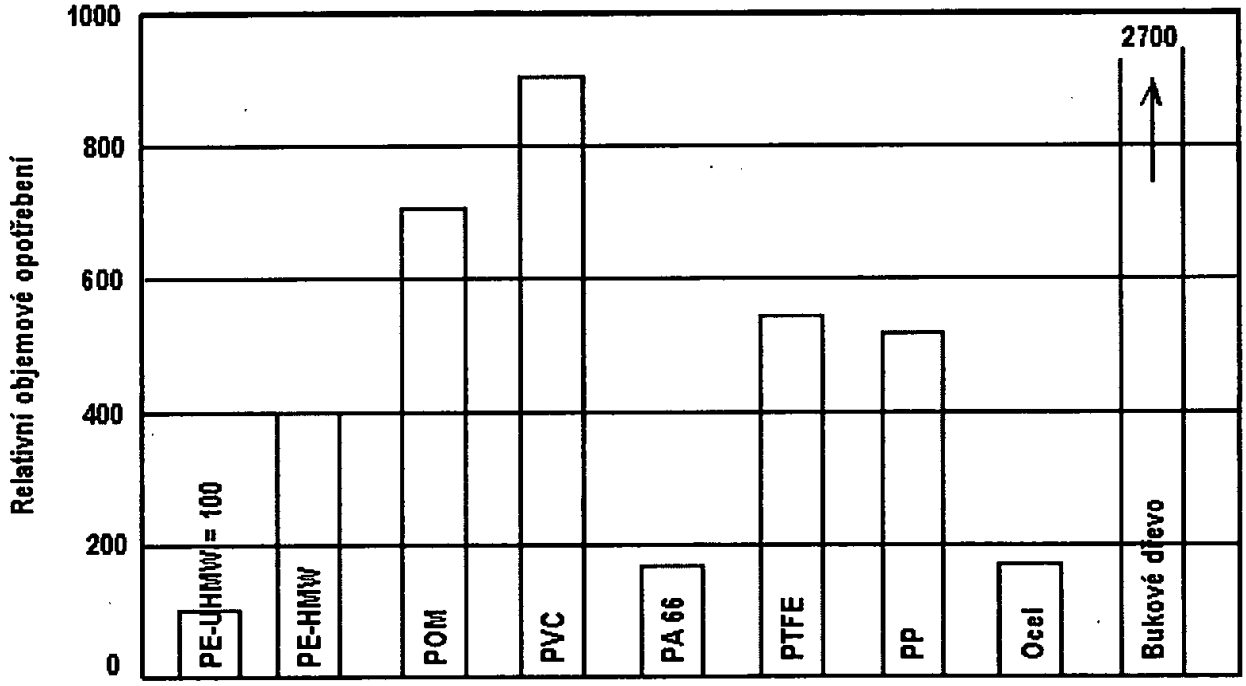
- základní
- tepelné
- mechanické
- elektrické
- relativní objemové opotřebení

	Zkušební metody				PE-UHMW Polystone M	PE-HMW Polystone D	PA 6 Sustamid 6	POM Sustarin C
Základní vlastnosti	DIN	ISO	ASTM	jednotky				
Hustota	53479	1183	D792	g/cm^3	0,93	0,96	1,14	1,41
Absorpce vody								
- po 24/96 hodinovém ponoření ve vodě o teplotě 23°C	53495	62	D750	mg %	0	0	86/168 1,26/2,5	20/37 0,24/0,45
- hygroskopičnost při teplotě vzduchu 23°C a relativní vlhkosti 50%	-	-	-	%	0	0	2,6	0,2
- nasákavost ve vodě o teplotě 23°C	-	-	-	%	0	0	9	0,85
Tepelné vlastnosti								
Bod tání	-	-	-	°C	130 - 135	125	220	165
Tepelná vodivost při 23°C	52612	-	-	W/(K.m)	0,41	0,41	0,28	0,31
Koeficient lineární tepelné roztažnosti								
- průměrná hodnota v rozmezí 23 - 60°C	-	-	-	m/(K.m)	2×10^{-4}	2×10^{-4}	90×10^{-6}	110×10^{-6}
- průměrná hodnota v rozmezí 23 - 100°C	-	-	-	m/(K.m)	-	-	105×10^{-6}	125×10^{-6}
Teplota deformace namáhání ohybem								
- metoda A : 1,8 N/mm^2	53461	75	D648	°C	42	-	80	110

Max. přípustná provozní teplota vzduchu								
- krátkodobá	-	-	-	°C	90	80	160	140
- nepřetržitá (5 a 20 tis. hodin)	-	-	-	°C	65	65	85 / 70	115 / 100
Min. provozní teplota	-	-	-	°C	- 265	-100	- 40	- 50
Hořlavost								
- podle ASTM (kyslíkový index)	-	4589	D2863	%	-	-	25	15
- podle UL 94 (tloušťka 3/6 mm)	-	-	*94	-	-	-	HB / V-2	HB / HB
Mechanické vlastnosti								
Zkouška pevnosti v tahu								
- mez pevnosti v tahu	53455	527	D638M	N/mm^2	> 17 MPa	40	78	70
- průtažnost	53455	527	D638M	%	> 50	-	> 50	30
- modul průtažnosti	53457	527	D638M	N/mm^2	-	-	3100	3000
Zkouška tečení v tlaku								
- tlak jenž způsobí 1% prodloužení za 1000 hod.	53444	899	D2990	N/mm^2	230 MPa	-	18	14
Rázová houževnatost - Charpy	53453	179/3D	-	kJ/m^2	bez lomu	bez lomu	bez lomu	bez lomu
Vrubová houževnatost								
- Charpy	53453	179/3C	-	kJ/m^2	bez lomu	bez lomu	4	8
- Izod	-	180/2A	D256	kJ/m^2	bez lomu	bez lomu	5,5	8
Tvrdost								
- podle Rockwella	-	22039-2	D785		-	-	M 85	M 86
- podle Brinella	-	2039-1	-	N/mm^2	36	-	-	-
Elektrické vlastnosti								
Dielektrická pevnost	53481	243	D149	kV/mm	45	90	25	20
Měrný vnitřní odpor	53482	93	D257	Ohm×cm	$> 10^{14}$	$> 10^{14}$	10^{15}	10^{14}
Povrchový odpor	53482	93	D257	Ohm	$> 10^{12}$	$> 10^{12}$	10^{15}	10^{15}

Dielektrická konstanta								
- při 50 Hz	53483	250	D150	-	2,1	-	3,9	3,6
- při 1 MHz	53483	250	D1550	-	3,0	-	3,3	3,6
Disipační činitel tan delta								
- při 50 Hz	53483	250	D150	-	$3{,}9\times10^{-4}$	-	0,019	0,015
- při 1 MHz	53483	250	D150	-	-	-	0,021	0,008
Odolnost proti plazivým proudům	-	112	-	-	CTI 600	-	CTI 600	CTI 600

Relativní objemové opotřebení různých materiálů



Technické plasty

S&CH Trade CZ s.r.o.

ExxonMobil Chemical

HYDROCARBON FLUIDS

Sales Specification
Rev. 10 (08/00)

ISOPAR H FLUID

Properties	Test Methods	Sales Specifications
Aniline Point, (°C)	ASTM D 611	83 - 87
Appearance	Visual	Pass
Aromatics Content, (wt. %)	AM-S 140.31	0.01 max
Bulk Odor	BTQAL – 018	Pass
Bromine Index, (mg Br/100 g)	ASTM D 2710	20 max
Color, (Saybolt Units)	ASTM D 156	30 min
Dielectric Constant @ 25°C	AM-I 915	2.000 – 2.020
Distillation	ASTM D 86	
IBP, (°C)		171 min
50% Recovered, (°C)		177 - 185
DP, (°C)		191 max
Flash Point, (°C)	ASTM D 56	49 min
Specific Gravity @ 15.6/15.6°C	ASTM D 4052	0.756 – 0.761
Specific Conductivity, $(OHM\text{-}CM)^{-1}$	AM-I 915 Note: same test as dielectric constant	50×10^{-15} max
Sulfur Content, (ppm)	ASTM D 4045	5 max

AMERICAS

The test methods specified above, or their equivalent, will be used in conjunction with ASTM D 3244, "Standard Practices for Utilization of Test Data to Determine Conformance with Specifications."

ExxonMobil's sampling and testing procedures in effect at the time of production will be used for certification testing. Results may be based on tank certification, manufacturing data, periodic testing and/or most recent product restock. ExxonMobil reserves the right to use other equivalent test methods in certifying this product.